

REMARKS

Claims 1-38 are pending.

Claims 12-32 have been cancelled.

Claims 1-4 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879).

Claims 5-9 and 33-38 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879) and further in view of Mahawili (US 5,059,770) or Carman et al (US 5,294,778).

Claim 10 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879) and further in view of Weber (US 4,518,848).

Claim 11 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879) and further in view of Yoshida (US 6,080,970).

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

Election/Restrictions:

Claims 1-38 are pending in the application and restriction has been required as to three groups:

Group I comprising claims 1-11, and 33-38 directed to figure 3;

Group II comprising claims 12-21 directed to figure 4; and

Group III comprising claims 22-32 directed to figure 5.

Applicant has elected to pursue Group I comprising claims 1-11, and 33-38 without traverse.

Accordingly, Applicant hereby cancels the remaining claims 12-32, which it reserves the right to pursue in one or more divisional cases.

Changes in the Drawings:

The drawings have been amended in response to the Examiner's request for the purpose of overcoming the Examiner's objection.

FIGS. 1 and 2 stands objected to on the grounds that the legend "Prior Art" is missing. MPEP §608.02(g). FIGS. 1, 2 have been amended to be designated with the legend "Prior Art." Applicant therefore requests that the objection to the Drawings be withdrawn.

No new matter has been added. Approval of the corrections is respectfully requested.

Changes in the Specification:

The specification has been amended for the purpose of improving the readability of the application and are of a clerical, typographical or grammatical nature. No new matter has been added.

Specifically, "said flat support receiving an incoming heat flux from a plasma during a process" is supported in the specification at page 11, lines 10-15.

Furthermore, the limitation "wherein the heat from said incoming heat flux and said heater is balanced with the cooling from said temperature controlled base such as to control the temperature of said workpiece" in claim 1 is supported by the specification at page 12, lines 4-16.

Changes in the Claims:

Claims 1, 33, and 36 have been amended or added in this application to further particularly point out and distinctly claim subject matter regarded as the invention. No new matter has been added.

Rejection under 35 USC §103(a) – claims 1-4

Claims 1-4 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879). This rejection is respectfully traversed.

Under MPEP §706.02(j), in order to establish a prima facie case of obviousness required for a §103 rejection, three basic criteria must be met: (1) there must be some suggestion or motivation either in the references or knowledge generally available to modify the reference or combine reference teachings (MPEP §2143.01), (2) a reasonable expectation of success (MPEP §2143.02), and (3) the prior art must teach or suggest all the claim limitations (MPEP §2143.03). See In re Royka, 490 F. 2d 981, 180 USPQ 580 (CCPA 1974).

Furuya teaches a spring-mounted temperature measurement apparatus disposed within a wafer holder. Furuya suggests measuring the temperature in absence of a plasma process in a wafer storage chamber (FIG. 1).

Kuibira teaches a wafer holder wherein the wafer holder prevents heats from spreading toward the backside of the holder.

Neither Furuya nor Kuibira teach or suggest a “flat support for holding a workpiece” where the “flat support [is] receiving an incoming heat flux from a plasma during a process.” Claim 1.

Furthermore, neither Furuya nor Kuibira teach or suggest that “the heat from said incoming heat flux and said heater is **balanced** with the cooling from said temperature controlled base such as to control the temperature of said workpiece.”

Thus, Applicant submits that claims 1-4 recite novel subject matter which distinguishes over any possible combination Furuya nor Kuibira.

Rejection under 35 USC §103(a) – claims 5-9 and 33-38

Claims 5-9 and 33-38 stand rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879) and further in view of Mahawili (US 5,059,770) or Carman et al (US 5,294,778). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 10

Claim 10 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879) and further in view of Weber (US 4,518,848). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Rejection under 35 USC §103(a) – claim 11

Claim 11 stands rejected under 35 USC §103(a) as being allegedly unpatentable over Furuya et al (US 6,084,215) in view of Kuibira et al (US 6,365,879) and further in view of Yoshida (US 6,080,970). This rejection is respectfully traversed.

These rejections are respectfully traversed for at least the reason that each of the rejected claims ultimately depend on an above-discussed base claim. The arguments set forth above regarding the base claims are equally applicable here. The base claims being allowable, the dependent claims must also be allowable.

Conclusion

For all of the above reasons, applicants submit that the amended claims are now in proper form, and that the amended claims all define patentable subject matter over the prior art. Therefore, Applicants submit that this application is now in condition for allowance.

Request for allowance

It is believed that this Amendment places the above-identified patent application into condition for allowance. Early favorable consideration of this Amendment is earnestly solicited. If, in the opinion of the Examiner, an interview would expedite the prosecution of this application, the Examiner is invited to call the undersigned attorney at the number indicated below.

Respectfully submitted,
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

Claims 1, 33, and 36 have been amended as follows:

1. (Once Amended) A chuck for a plasma processor, said chuck comprising:

 a temperature controlled base;
 a thermal insulator disposed on top of said base[, said thermal insulator having a thermal conductivity of less than about 1W/mK];

 a flat support for holding a workpiece, said flat support disposed on top of said thermal insulator, said flat support receiving an incoming heat flux from a plasma during a process; and

 a heater embedded within said flat support,
wherein the heat from said incoming heat flux and said heater is balanced with the cooling from said temperature controlled base such as to control the temperature of said workpiece.

33. (Once Amended) A method for controlling the temperature across a workpiece profile having multiple zones, said method comprising:

 providing a base maintained at a constant temperature, said constant temperature being below the temperature of the workpiece, said base having a thermal insulator mounted on top of said base;

 holding the workpiece against a top face of a workpiece holder, said workpiece holder mounted on top of said thermal insulator; [and]

applying a heat flux from a plasma during a process to the workpiece; and

heating each zone of the workpiece independently with a heater disposed within said workpiece holder.

36. (Once Amended) An apparatus for controlling the temperature across a workpiece profile having multiple zones, said apparatus comprising:

means for maintaining a base at a constant temperature, said constant temperature being below the temperature of the workpiece, said base having a thermal insulator mounted on top of said base;

means for holding the workpiece against a top face of a workpiece holder, said workpiece holder mounted on top of said thermal insulator; [and]

means for applying a heat flux from a plasma during a process to the workpiece;
and

means for independently heating each zone of the workpiece with a heater disposed within said workpiece holder.

In the Specification:

The following paragraph has been added at page 7, line 15:

-- FIG. 3A is a schematic of the thermal dynamic in the apparatus of FIG. 3 in accordance with one embodiment of the present invention. --

The paragraph beginning at page 10, line 5 has been amended as follows:

-- The support 306 may comprise a ceramic or metallic material. The ceramic may comprise a high temperature non-electrically conductive material, such as for

example alumina. The high temperature may include the temperature of a workpiece during a typical plasma etching process, i.e. about 300C. The shape of the support 306 may preferably include a conventional disk commonly used in plasma etching systems. The [workpiece] support 306 may be a conventional electrostatic chuck or may be a ceramic having a mechanical clamp for holding down the wafer 310. The thickness of the support 306 is preferably about 2mm. However any other thickness may be suitable. The support 306 construction may preferably be of a "thin disk bonded to a base" type, otherwise the lateral conduction may be so high that the heater input will be spread laterally resulting in an ineffective zone separation. The thickness of the support 306 may preferably be about 0.040". --

The paragraph beginning at page 11, line 10 has been amended as follows:

-- FIG. 3A illustrates a simplified schematic of the thermal dynamic in the apparatus of FIG. 3. The incoming flux Q1 contributes to the temperature T1 on the surface of the wafer 310. The heater 308 provides additional heat [Q2] Q3 to the wafer 310. The flux Q2 exiting the system through the workpiece support 306 to the cooled base 302 is approximately equal to both incoming flux Q1 and Q3. Therefore: --

The paragraph beginning at page 13, line 22 has been amended as follows:

-- The first interface 506 and second interface 510 may comprise a layer of bonding adhesive, such as polymer. The thickness of each interface 506 and 510 may be preferably about .003". The thickness of the thermal insulator [514] 508 and the workpiece holder 512 may be preferably about .040" each. --